FIG. 1

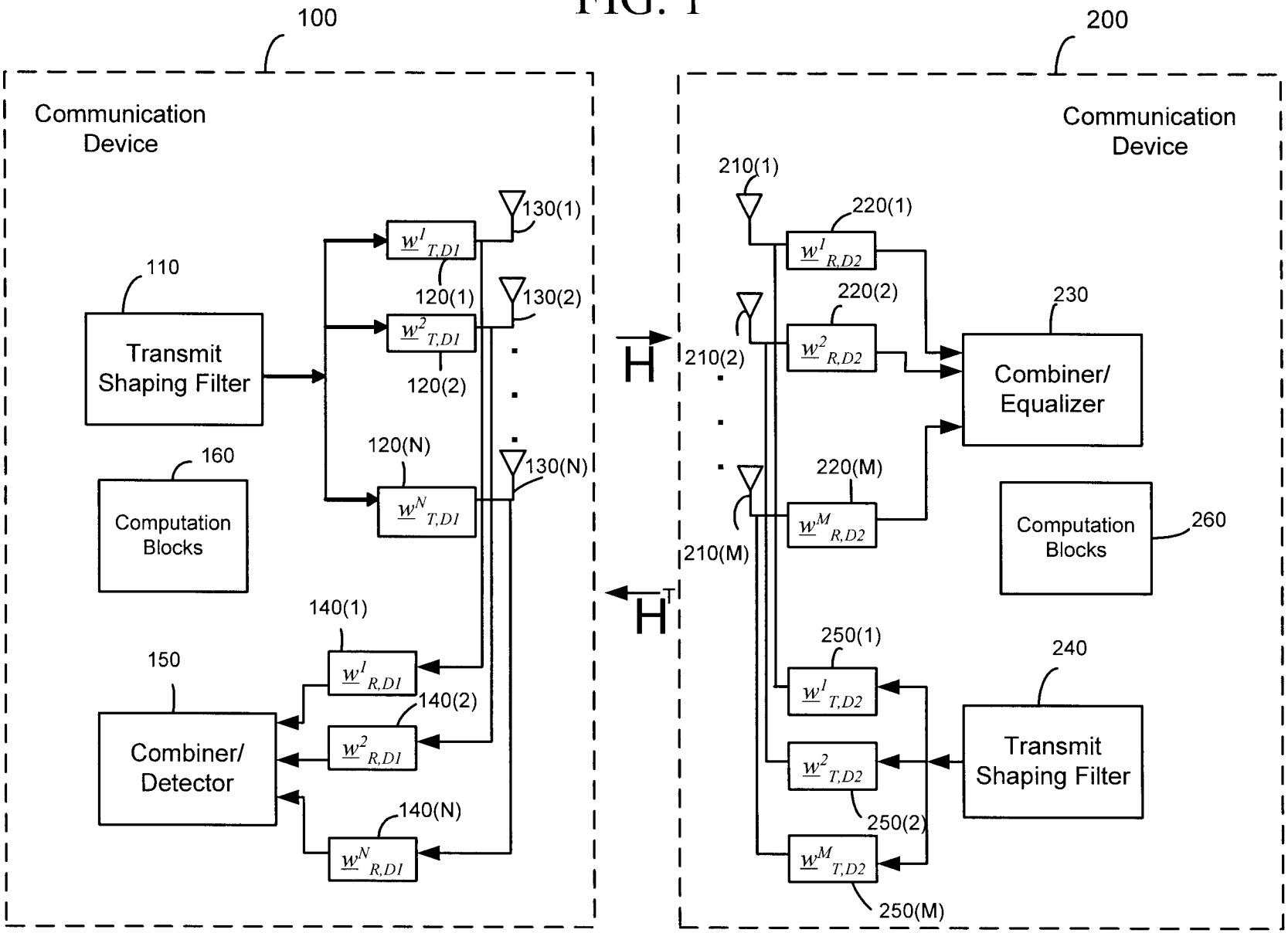

100
Communication Device
110
Transmit Shaping Filter
160
Computation Blocks
150
Combiner/ Detector
130(1)
130(2)
130(N)
120(1)
120(2)
120(N)
140(1)
140(2)
140(N)
H
H^T
200
Communication Device
210(1)
210(2)
210(M)
220(1)
220(2)
220(M)
230
Combiner/ Equalizer
260
Computation Blocks
240
Transmit Shaping Filter
250(1)
250(2)
250(M)

FIG. 2

$$\underline{h}^{ij} = \left(h_0^{ij}, h_1^{ij}, \ldots, h_{L-1}^{ij}\right)^T$$ Channel Response Vector

Channel Response Matrix

$$H_{ij} = \begin{bmatrix} h_0^{ij} & 0 & 0 & & 0 \\ h_1^{ij} & h_0^{ij} & 0 & & 0 \\ . & h_1^{ij} & h_0^{ij} & & . \\ . & . & h_1^{ij} & & 0 \\ h_{L-1}^{ij} & . & . & . \; . \; . & h_0^{ij} \\ 0 & h_{L-1}^{ij} & . & & h_1^{ij} \\ 0 & 0 & h_{L-1}^{ij} & & . \\ . & 0 & 0 & & . \\ . & . & . & & . \\ 0 & 0 & 0 & & h_{L-1}^{ij} \end{bmatrix} = \begin{bmatrix} \underline{h}^{ij} & 0 & 0 & & 0 \\ 0 & \underline{h}^{ij} & 0 & & 0 \\ 0 & 0 & \underline{h}^{ij} & & . \\ . & 0 & 0 & . \; . \; . & . \\ . & . & . & & 0 \\ 0 & 0 & 0 & & \underline{h}^{ij} \end{bmatrix}$$

FIG. 3

Transmit Antenna Filter Super Matrix

$$\mathbf{W}_{T,DI}=\begin{bmatrix}\mathbf{W}^{1}_{T,DI}\\ \mathbf{W}^{2}_{T,DI}\\ .\\ .\\ \mathbf{W}^{N}_{T,DI}\end{bmatrix}$$

Transmit Filter Matrix for Antenna i

$$\mathbf{W}^{i}_{T,DI}=\begin{bmatrix} w^{i}_{T,D1,0} & 0 & 0 & & 0\\ w^{i}_{T,D1,1} & w^{i}_{T,D1,0} & 0 & & 0\\ . & w^{i}_{T,D1,1} & w^{i}_{T,D1,0} & & .\\ . & . & w^{i}_{T,D1,1} & & 0\\ w^{i}_{T,D1,LTD1-1} & . & . & . . . & w^{i}_{T,D1,0}\\ 0 & w^{i}_{T,D1,LTD1-1} & . & & w^{i}_{T,D1,1}\\ 0 & 0 & w^{i}_{T,D1,LTD1-1} & & .\\ . & 0 & 0 & & .\\ . & . & . & & .\\ 0 & 0 & 0 & & w^{i}_{T,D1,LTD1-1}\end{bmatrix}=\begin{bmatrix} \underline{w}^{i}_{T,D1} & 0 & 0 & & 0\\ 0 & \underline{w}^{i}_{T,D1} & 0 & & 0\\ 0 & 0 & \underline{w}^{i}_{T,D1} & & .\\ . & 0 & 0 & . . . & .\\ . & . & . & & 0\\ 0 & 0 & 0 & & \underline{w}^{i}_{T,D1}\end{bmatrix}$$

Transmit Filter Super Vector for N Antennas of First Communication Device (D1)

$$\underline{w}_{T,DI}=\begin{bmatrix}\underline{w}^{1}_{T,DI}\\ \underline{w}^{2}_{T,DI}\\ \underline{w}^{3}_{T,DI}\\ .\\ .\\ .\\ .\\ .\\ \underline{w}^{N}_{T,DI}\end{bmatrix}$$

Transmit Filter Sub-Vector for Antenna i of D1

$$\underline{w}^{i}_{T,DI}=\begin{bmatrix} w^{i}_{T,DI,0}\\ w^{i}_{T,DI,1}\\ w^{i}_{T,DI,2}\\ .\\ .\\ .\\ .\\ .\\ w^{i}_{T,DI,LTD1-1}\end{bmatrix}\Bigg\}\ \text{LTD1}$$

FIG. 4

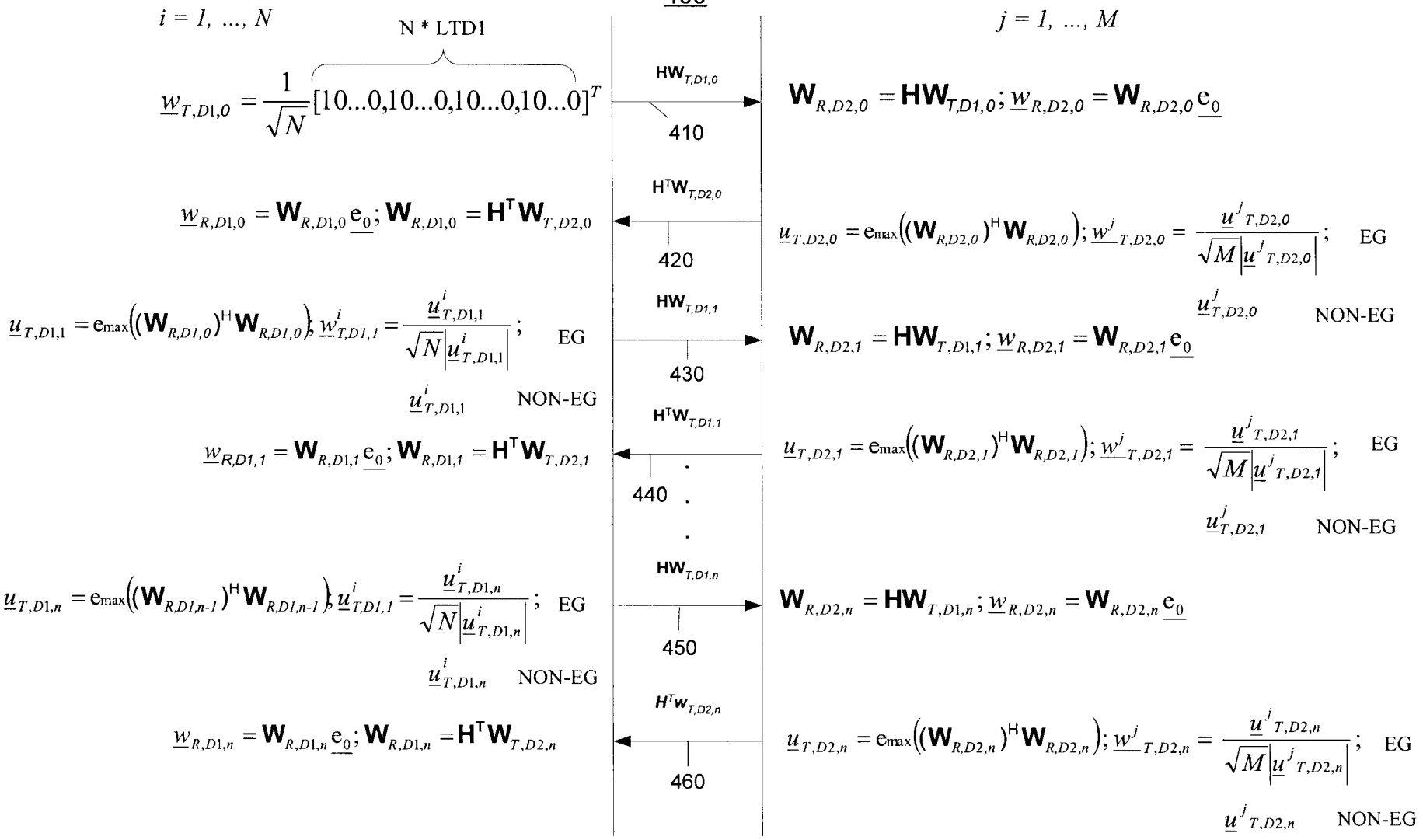

400
i = 1, ..., N
N * LTD1
$\underline{w}_{T,D1,0} = \frac{1}{\sqrt{N}}[10...0,10...0,10...0,10...0]^T$
$\mathbf{HW}_{T,D1,0}$
410
$\mathbf{W}_{R,D2,0} = \mathbf{HW}_{T,D1,0}; \underline{w}_{R,D2,0} = \mathbf{W}_{R,D2,0}\underline{e}_0$
$\underline{w}_{R,D1,0} = \mathbf{W}_{R,D1,0}\underline{e}_0; \mathbf{W}_{R,D1,0} = \mathbf{H}^T\mathbf{W}_{T,D2,0}$
$\mathbf{H}^T\mathbf{W}_{T,D2,0}$
420
$\underline{u}_{T,D2,0} = e_{max}\left((\mathbf{W}_{R,D2,0})^H\mathbf{W}_{R,D2,0}\right); \underline{w}^j{}_{T,D2,0} = \frac{\underline{u}^j{}_{T,D2,0}}{\sqrt{M}\left|\underline{u}^j{}_{T,D2,0}\right|}$; EG
$\underline{u}^j_{T,D2,0}$ NON-EG
$\underline{u}_{T,D1,1} = e_{max}\left((\mathbf{W}_{R,D1,0})^H\mathbf{W}_{R,D1,0}\right); \underline{w}^i_{T,D1,1} = \frac{\underline{u}^i_{T,D1,1}}{\sqrt{N}\left|\underline{u}^i_{T,D1,1}\right|}$; EG
$\mathbf{HW}_{T,D1,1}$
430
$\mathbf{W}_{R,D2,1} = \mathbf{HW}_{T,D1,1}; \underline{w}_{R,D2,1} = \mathbf{W}_{R,D2,1}\underline{e}_0$
$\underline{u}^i_{T,D1,1}$ NON-EG
$\mathbf{H}^T\mathbf{W}_{T,D1,1}$
$\underline{w}_{R,D1,1} = \mathbf{W}_{R,D1,1}\underline{e}_0; \mathbf{W}_{R,D1,1} = \mathbf{H}^T\mathbf{W}_{T,D2,1}$
440
$\underline{u}_{T,D2,1} = e_{max}\left((\mathbf{W}_{R,D2,1})^H\mathbf{W}_{R,D2,1}\right); \underline{w}^j{}_{T,D2,1} = \frac{\underline{u}^j{}_{T,D2,1}}{\sqrt{M}\left|\underline{u}^j{}_{T,D2,1}\right|}$; EG
$\underline{u}^j_{T,D2,1}$ NON-EG
$\mathbf{HW}_{T,D1,n}$
$\underline{u}_{T,D1,n} = e_{max}\left((\mathbf{W}_{R,D1,n-1})^H\mathbf{W}_{R,D1,n-1}\right); \underline{u}^i_{T,D1,1} = \frac{\underline{u}^i_{T,D1,n}}{\sqrt{N}\left|\underline{u}^i_{T,D1,n}\right|}$; EG
$\mathbf{W}_{R,D2,n} = \mathbf{HW}_{T,D1,n}; \underline{w}_{R,D2,n} = \mathbf{W}_{R,D2,n}\underline{e}_0$
450
$\underline{u}^i_{T,D1,n}$ NON-EG
$H^T w_{T,D2,n}$
$\underline{w}_{R,D1,n} = \mathbf{W}_{R,D1,n}\underline{e}_0; \mathbf{W}_{R,D1,n} = \mathbf{H}^T\mathbf{W}_{T,D2,n}$
460
$\underline{u}_{T,D2,n} = e_{max}\left((\mathbf{W}_{R,D2,n})^H\mathbf{W}_{R,D2,n}\right); \underline{w}^j{}_{T,D2,n} = \frac{\underline{u}^j{}_{T,D2,n}}{\sqrt{M}\left|\underline{u}^j{}_{T,D2,n}\right|}$; EG
$\underline{u}^j{}_{T,D2,n}$ NON-EG
j = 1, ..., M

FIG. 5

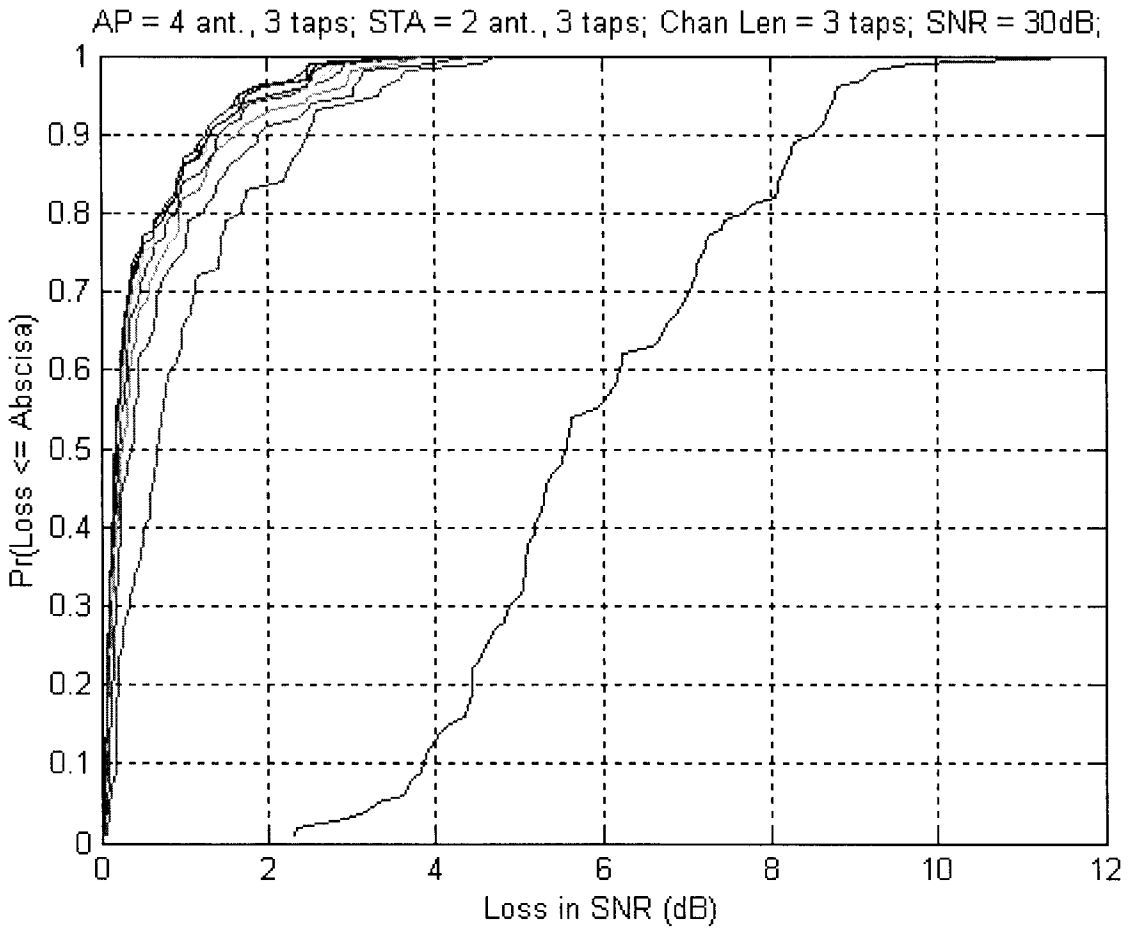

AP = 4 ant., 3 taps; STA = 2 ant., 3 taps; Chan Len = 3 taps; SNR = 30dB;
Pr(Loss <= Abscisa)
Loss in SNR (dB)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
2
4
6
8
10
12

FIG. 6

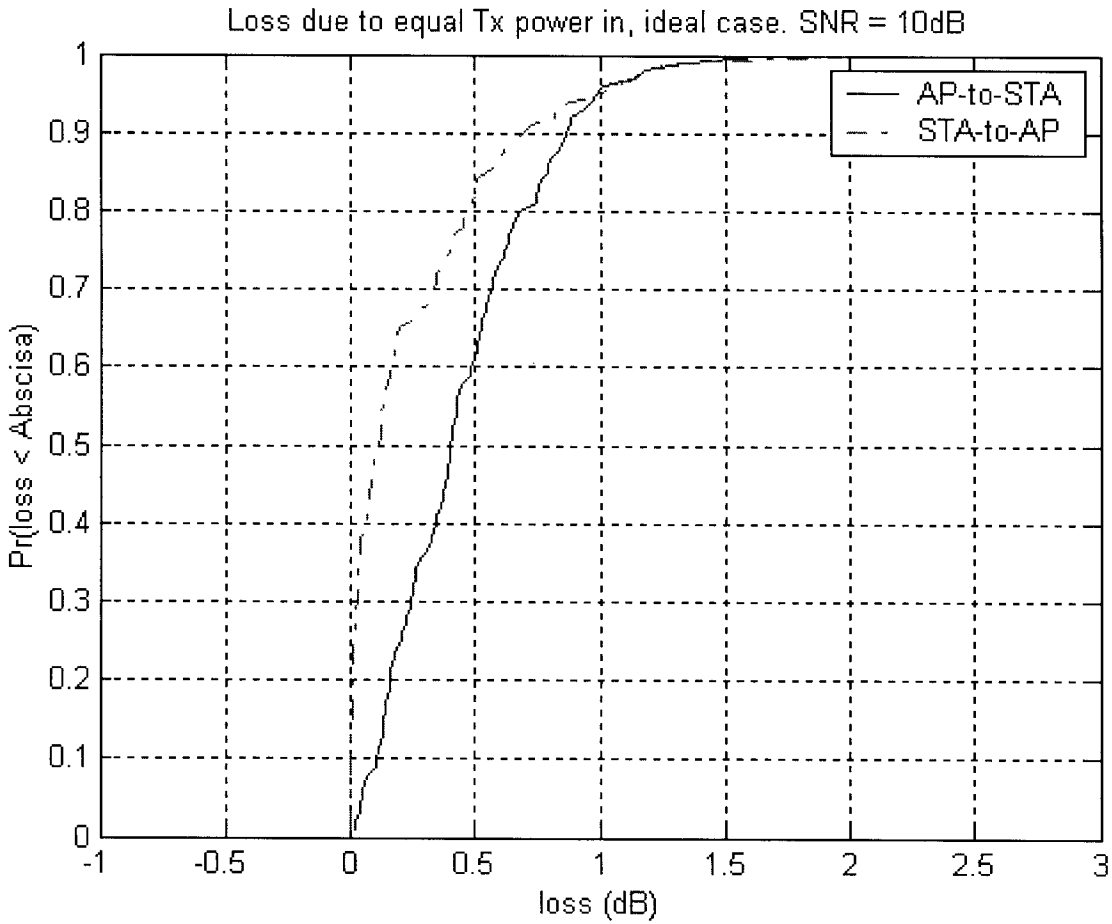

Loss due to equal Tx power in, ideal case. SNR = 10dB
AP-to-STA
STA-to-AP
Pr(loss < Abscisa)
loss (dB)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-1
-0.5
0
0.5
1
1.5
2
2.5
3

FIG. 7

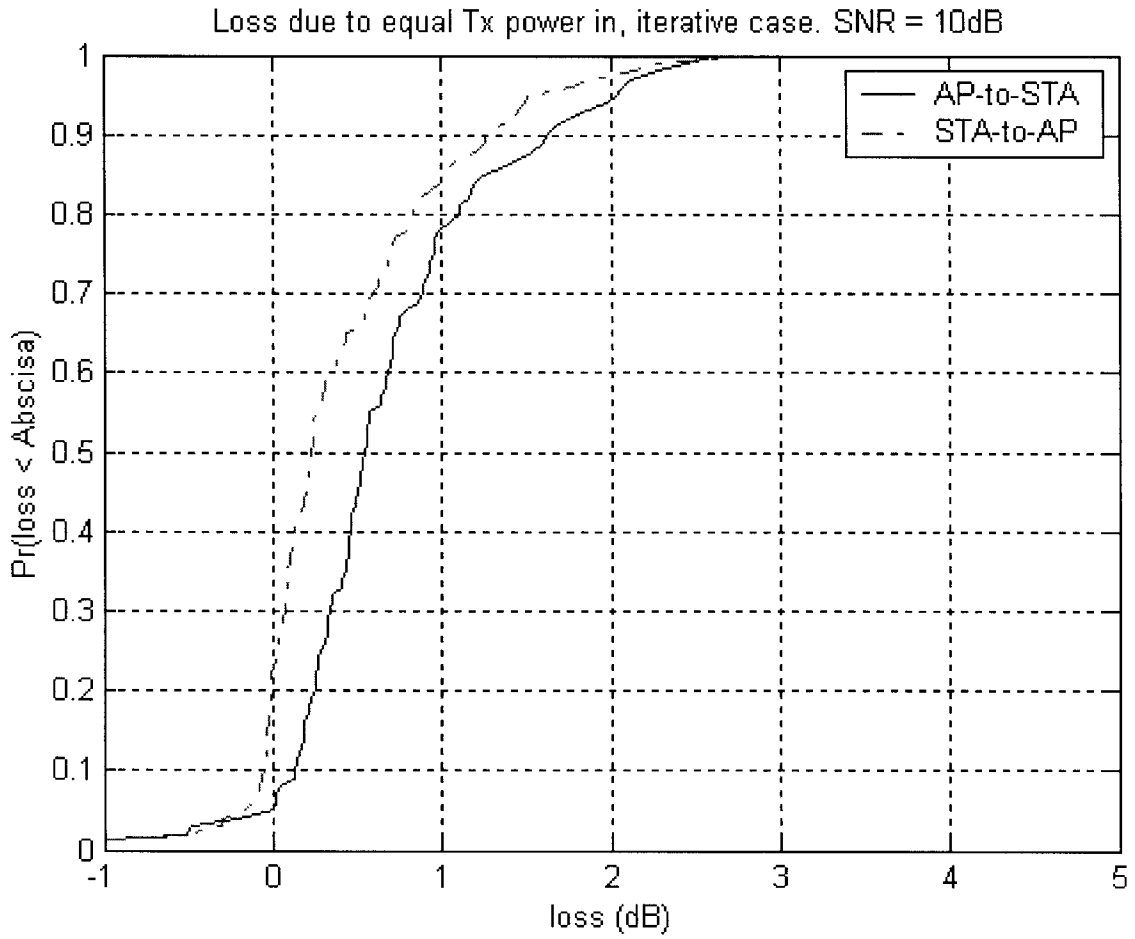
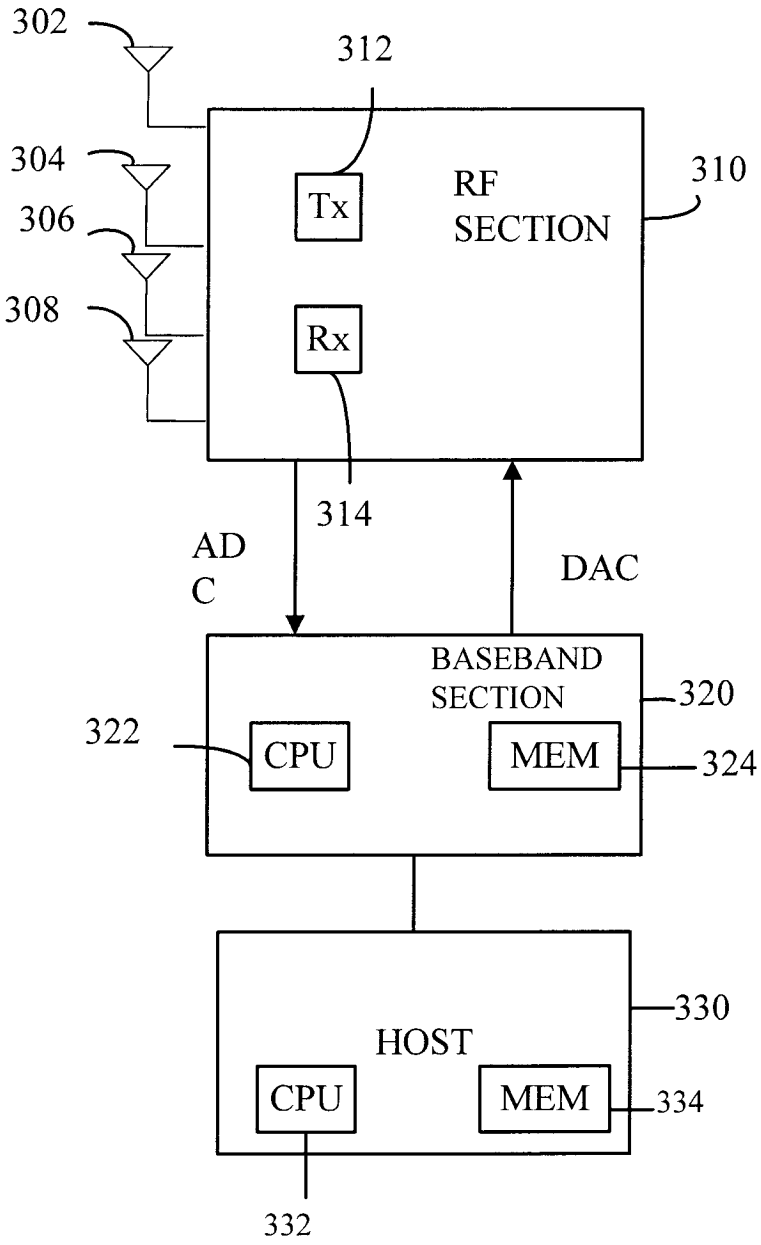

Loss due to equal Tx power in, iterative case. SNR = 10dB
AP-to-STA
STA-to-AP
Pr(loss < Abscisa)
loss (dB)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
-1
0
1
2
3
4
5

FIG. 8


302
312
304
306
308
Tx
Rx
RF
SECTION
310
314
AD
C
DAC
BASEBAND
SECTION
320
322
CPU
MEM
324
330
HOST
CPU
MEM
334
332